

## MEE427 Term Project Assignment

1. What is the purpose of the project that explained and details shared in the course?
2. Briefly describe the given physical system. Draw the system block diagram in your description.
3. What is the purpose of collecting data? What is the input and what is the output?
4. What equipment have been provided to you to collect data?
5. Explain the data collecting procedure. Did you have to design an electronic circuit? Why? Which hardware and software have you used during the data collecting procedure? Reinforce your description by giving a screenshot on software.
6. Is the given system black box or gray box? Explain the reason briefly.
7. What mathematical method did you use to determine the parameters of the transfer function? Explain briefly.
8. Explain why you have collected 5 different datasets. How many did you use to estimate parameters?
9. Plot the estimated angular velocity, angular acceleration and angular jerk with respect to time for each different inputs.
10. Have you applied any filtering operation to data? Why? If so, plot all the filtered and raw data on a graph with respect to time. Comment on the graphical results.
11. According to the data you collected and estimated, what is the resultant transfer function of given system?
12. Why do we need validation? Explain your validation procedure and plot the related graphs.
13. Why haven't you used the built-in encoder for the positional feedback? Explain.
14. Explain the potentiometer calibration procedure.
15. Design and simulate following requirements with specified controllers by using an appropriate simulation program and show the results clearly by using graphs.
  - a. With P Controller, obtain the shortest rise time (fastest possible response).
  - b. With PI Controller, cancel the steady state error with minimum overshoot.
  - c. With PID Controller, obtain the fastest response without steady state error.
16. Apply each resultant controllers of the previous question to the real system and log and plot the real life system response. Compare the results. If you need further tuning, give details that clarifies your tuning approach and show all resultant response.
17. Share the generic code that includes the PID control algorithm. Explain each row as comments.
18. How did you log the results with the microcontroller that you have used? Explain.
19. Write a brief discussion and conclusion part for this project.

*The report should be delivered as a hard copy until 23/12/2022 17:00.*